

Notice of Allowability

Application No.

09/548,736

Applicant(s)

ZHENG, QINGHUA

Examiner

Eduardo Garcia-Otero

Art Unit

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Request for continued examination received 8/13/04.
2. ☒ The allowed claim(s) is/are 1-4, 6-18, 20 and 21.
3. ☒ The drawings filed on 13 April 2000 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

KEVIN J. TESWA
SUPERVISORY
PATENT EXAMINER

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Allowance

Introduction

1. Title is: Method and Apparatus for Validating Cross-Architecture ISA Emulation.
2. First named inventor is: ZENG.
3. This allowance is in response to Applicant's Request for Continued Examination, received 8/13/2004.
4. Claims 1-4, 6-18, and 20-21 are pending, and are allowed.
5. US Application was filed on 4/13/00, and no earlier priority is claimed.

Index of Important Prior Art

6. Mitchell refers to US Patent 4,841,476.
7. Banks refers to Handbook of Simulation, by Jerry Banks, John Wiley & Sons, Inc., August 1998, ISBN 0-471-13403-1, pages 3, 15-19.
8. Aharon refers to US Patent 5,202,889.
9. Tucker refers to The Computer Science and Engineering Handbook, by Allen B. Tucker, CRC Press, ISBN: 0-8493-2909-4, 1996, pages 412-415.
10. Gowin refers to US Patent 6,606,721 which claims priority to provisional application 60/165,204 filed Nov. 12, 1999.
11. Scalzi refers to US Patent 6,009,261.
12. Lethin refers to US Patent 6,463,582.

REASONS FOR ALLOWANCE

13. Independent claim 1 (currently amended) states "a target architecture engine capable of executing the binary instruction concurrently with the native architecture execution engine..." and "comparing... the verification engine pinpoints an exact machine instruction, a register number, and an input machine state that caused the emulation failure". This claim is allowable because it is not obvious to combine these limitations. Also see Applicant's assertions at Remarks page 9 regarding the verification engine.
14. All other pending claims are allowed for the same reasons.
15. The technical definitions and claim interpretations are presented below, and some additional prior art is cited.
16. All prior objections and rejections are withdrawn.

Definitions

17. Freedman refers to The Computer Desktop Encyclopedia by Alan Freedman, The Computer Language Company Inc., 1996. ISBN 0-8144-0010-8.

- **EMULATOR:** “A device that is built to work like another. A computer can be designed to emulate another model and execute software that was written to run in the other machine. A terminal can be designed to emulate various communications protocols and connect to different networks. The emulator can be hardware, software or both.”
- **ERROR HANDLING:** “Routines in a program that respond to errors. The measurement of quality in error handling is based on how the system informs the user of such conditions and what alternatives it provides for dealing with them”.
- **INSTRUCTION SET:** “The repertoire of machine language instructions that a computer can follow (from a handful to several hundred). It is a major architectural component and is either built into the CPU or into microcode. Instructions are generally from one to four bytes long.”
- **ISA:** “(1) (Industry Standard Architecture)... An expansion bus commonly used in PCs.... (2) (Interactive Services Association) A trade group for the online industry...”.
- **SIMULATION:** “(1) The mathematical representation of the interaction of real-world objects. *See scientific applications.* (2) The execution of a machine language program designed to run in a foreign computer.” Italics in original.
- **TCP/IP:** “(Transmission Control Protocol/Internet Protocol) A communications protocol... to internetwork dissimilar systems. It is a de facto UNIX standard, but is supported on almost all platforms. TCP/IP is the protocol of the Internet”.

18. McGraw-Hill Dictionary refers to The McGraw-Hill Dictionary of Scientific and Technical Terms, Fourth Edition, by McGraw-Hill Companies, Inc., ISBN 0-07-05270-9, 1989.

- **EMULATION:** “[COMPUT SCI] Imitation of one computer system by another so that the latter functions in exactly the same way and runs the same programs.”
- **EMULATION MODE:** “[COMPUT SCI] A method of operation in which a computer actually executes the instructions of a different (simpler) computer, in contrast to normal model.”

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- **EMULATOR:** “[COMPUT SCI] The microprogram-assisted macroprogram which allows a computer to run programs written for another computer.”
- **EMULATOR CIRCUIT:** [COMPUT SCI] A circuit built into a computer’s control section to enable it to process instructions that were written for another computer.”
- **SIMULATE:** “[ENG] To mimic some or all of the behavior of one system with a different dissimilar system, particularly with computers, models, or equipment.”

19. **Banks** refers to Handbook of Simulation, by Jerry Banks, John Wiley & Sons, Inc., August 1998, ISBN 0-471-13403-1, page 3.

- **SIMULATION:** “Simulation is the imitation of the operation of a real-world process or system over time. Simulation involves the generation of an artificial history of the system and the observation of that artificial history to draw inferences concerning the operating characteristics of the real system that is represented”.

20. **IEEE Dictionary** refers to The Authoritative Dictionary of IEEE Standards and Terms, Seventh Edition, by IEEE Press, ISBN 0-7381-2601-2, 2000.

- **MACHINE INSTRUCTION:** “(1) (computers) An instruction that a machine can recognize and execute... (2) An instruction in the machine language of a particular processing unit of a computer. See also: computer instruction; machine code.”
- **MACHINE LANGUAGE:** “(2) (software) A language that can be recognized by the processing unit of a computer. Such a language usually consists of patterns of 1’s and 0’s, with no symbolic naming of operations or addresses... Contrast: symbolic language... (3) A programming language that is directly executed by the central processing unit (CPU) portion of a computer...”

Claim Interpretation

21. **The claim language is interpreted in light of the specification.** Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).
22. In claim 1, the term “**binary instruction sequence**” is interpreted as “machine level instruction sequence”. Also see specification page 2 lines 13-24, which state “The target

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computer architecture includes a binary emulator that translates the native instructions into binary instructions executable on the target computer architecture”.

23. In claim 1, the term “**native**” is interpreted as equivalent to the Mitchell term “source”, and equivalent to the Banks term “base”.
24. In claim 7 and throughout the claims, “**ISA**” is interpreted as “instruction set architecture”, per Applicant’s definition. Note that Applicant’s definition for said acronym is different from the definitions in the Freedman Encyclopedia: ISA: “(1) (Industry Standard Architecture)... An expansion bus commonly used in PCs.... (2) (Interactive Services Association) A trade group for the online industry...”. The Examiner suggests that the Applicant avoid the use of “ISA” in the claims, in order to avoid confusion.
25. In claim 16, the term “**first**” is interpreted as equivalent to the Mitchell term “source”, and equivalent to the Banks term “base”, and equivalent to the term “native” in claim 1.

Additional Prior Art

26. Lethin US Patent 6,463,582 discloses “analysis and optimizations that improve emulation... logging of information identifies instructions and instruction joint points” at Abstract.

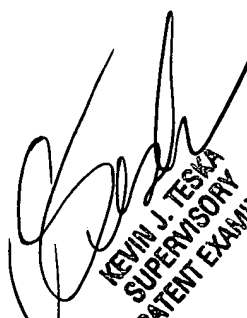
Conclusion

27. All pending claims are allowed.

Communication

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eduardo Garcia-Otero whose telephone number is 571-272-3711. The examiner can normally be reached on Monday through Thursday from 9:00 AM to 8:00 PM. If attempts to reach the Examiner by telephone are unsuccessful, the Examiner’s supervisor, Kevin Teska, can be reached at 571-272-3761. The fax phone number for this group is 703-872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the group receptionist, whose telephone number is (703) 305-3900.

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